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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.        | CONFIRMATION NO. |
|--|-------------|----------------------|----------------------------|------------------|
| 10/743,608   | 12/22/2003  | Sang Woo Nam         | 20063/10006                | 7552             |
| 34431  | 7590        | 11/09/2005           |                            |                  |
| HANLEY, FLIGHT & ZIMMERMAN, LLC<br>20 N. WACKER DRIVE<br>SUITE 4220<br>CHICAGO, IL 60606 |             |                      |                            |                  |
|  |             |                      | EXAMINER<br>FULK, STEVEN J |                  |
|  |             |                      | ART UNIT<br>2891           | PAPER NUMBER     |

DATE MAILED: 11/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/743,608

Applicant(s)

NAM, SANG WOO

Examiner

Steven J. Fulk

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 and 2 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1 and 2 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 26 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsau '493 in view of Huang et al '355.

Tsau teaches depositing a metal stack layer comprising copper or copper alloy with a titanium nitride barrier layer on a substrate, and forming a capacitor part and a contact part using the metal layer (paragraph 25); forming an insulating layer formed of nitride over the substrate, including the capacitor part and the contact part, and then forming a thicker interlayer dielectric layer on the insulating layer (paragraph 26; forming a first photoresist pattern on the ILD and removing parts of the ILD over the capacitor part and the contact part (paragraph 27); forming a second photoresist pattern over the ILD and removing material over the contact to expose the contact to the metal layer (paragraph 28); filling the openings with metal to form the upper capacitor electrode and the contact interconnect (paragraph 29).

Tsau does not show the use of tungsten as the metal for the upper plate of the capacitor and the contact interconnect. Huang et al. teaches the use of tungsten in the metallization of a semiconductor device (column 6, lines 38-47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the tungsten metallization of Huang et al.'s invention in the capacitor device of Tsau because tungsten is a conventional metal to use in interconnect metallization due to its compatibility with damascene CMP processes, good conductivity, and high melting point.

***Response to Arguments***

3. Applicant's arguments filed September 26, 2005 have been fully considered but they are not persuasive.

a. Applicant argues that Tsau only discloses the titanium nitride barrier layer being deposited under the first metal layer, and the reference does not teach depositing the barrier layer on top of the first metal layer.

This argument is not found persuasive because the reference teaches forming a TiN barrier layer on top of the first metal layer and under the second metal layer (paragraph 29). Thus, Tsau recites the relationship between the metal layer and titanium nitride layer as claimed by the applicant.

b. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958

F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the knowledge of using tungsten as a CMOS interconnect metal is taught by Huang et al. and is also generally available to one of ordinary skill in the art. Applicant argues that Tsau teaches away from using tungsten as an interconnect metal because the reference teaches using copper interconnects in a CMOS compatible process. While the Tsau does not explicitly mention that tungsten can be used in CMOS processes, this argument is not persuasive because Huang et al. does provide motivation for using tungsten by teaching it is a conventional metal used in MOS integrated circuits (col. 1, lines 10-40), and it is also well known in the art to use tungsten plugs as interconnects.

***Conclusion***

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

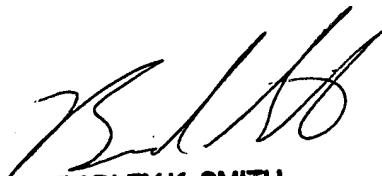
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5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven J. Fulk whose telephone number is (571) 272-8323. The examiner can normally be reached on Monday through Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sjf  
10/31/05



**BRADLEY K. SMITH**  
**PRIMARY EXAMINER**